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Functional balance and quality of life in breast cancer survivors

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ABSTRACT

Aims: Breast cancer is an important health problem with the second mortality rate in cancer-related deaths in women. After mastectomy and radiotherapy, shoulder and upper extremity mobility may decrease, trunk and upper extremity muscles may weaken, and biomechanical and functional balance may be impaired in women who have survived breast cancer. In addition, increased limb volume due to breast cancer-related lymphedema (BCRL) may impair static and dynamic balance. To date, studies investigating the effect of lymphedema on balance in BCRL are limited. We aimed to examine the impact of lymphedema on balance and quality of life in breast cancer survivors.

Methods: In this prospective study, age, education, marital status, body mass index (BMI) (kg/m^2), affected lymphedema limb (right-left), and extremity volume difference were evaluated. Fullerton Advanced Balance Scale (FAB-Scale) was applied to the patients to measure their level of balance. The Lymphedema Quality of Life Questionnaire (LYMQOL-Arm) was applied.

Results: The mean age of the 40 patients included in the study was 59.02±7.50 years. The proportion of patients with a Fab-scale ≤25 who were at risk of falls was 55%. There was no statistical difference between patients with Fab-scale ≤25 and patients with Fab-scale 25<in terms of quality of life score (LYMQOL-Arm) (p=0.344). There was a significant negative correlation between age and balance level (p=0.0138). There was no significant correlation between limb volume difference, BMI, quality of life, and balance level (p>0.05).

Conclusion: In our study, balance deteriorated and the risk of falls increased especially in elderly patients. Every woman with BCRL should be informed about balance and gait impairment and encouraged to receive lymphoedema treatment as soon as possible. We think that future studies examining functional stability, quality of life, and fall risk in the treatment of lymphedema and the development of special interventions related to balance will contribute to the oncological rehabilitation protocol.

Keywords: Breast cancer, lymphedema, quality of life, functional balance, fullerton advanced balance scale

INTRODUCTION

Despite new treatment technologies, breast cancer remains a major cause of mortality among women with the second highest number of deaths.[1] Radical mastectomy and modified radical mastectomy are the most commonly preferred surgical methods for the treatment of breast cancer.[2] Breast cancer treatment can cause tissue necrosis and scarring in the surgical site, reducing spine, chest, shoulder and upper limb mobility, weakening the trunk and upper limb muscles, and impairing biomechanical and functional balance.[3]

Breast cancer-related lymphedema (BCRL) is one of the major complications of radiotherapy after mastectomy. BCRL affects upper extremity functions with pain, swelling, increased diameter and stiffness in the affected arm. Impairment of upper body function affects exercise tolerance, neuromuscular function and functional balance.[4] This will increase the risk of falls and injuries in women who have had breast cancer.

In BCRL, an increase of at least 2 cm or 200 mL in volume around the arm compared to the unaffected arm is typical.[5] Depending on the asymmetric limb volume, the body center of gravity will be displaced. This change may disturb the static and dynamic balance.[6] To date, the effect of lymphedema on balance in women who have survived breast cancer is not fully understood, and studies investigating this issue are limited. This study aimed to investigate the effects of lymphedema on balance and quality of life after mastectomy.

METHODS

Participants

In this cross-sectional and prospective study, patients aged 18-75 years, breast cancer survivors, with unilateral lymphedema, who were treated and followed up in the Physical Medicine and Rehabilitation outpatient clinic of Ankara Dr. Abdurrahman Yurtaslan Oncology Training and Research Hospital between July 2022 and December 2022 were included. All patients were informed about the study and informed consent forms were obtained. Our study was conducted following the

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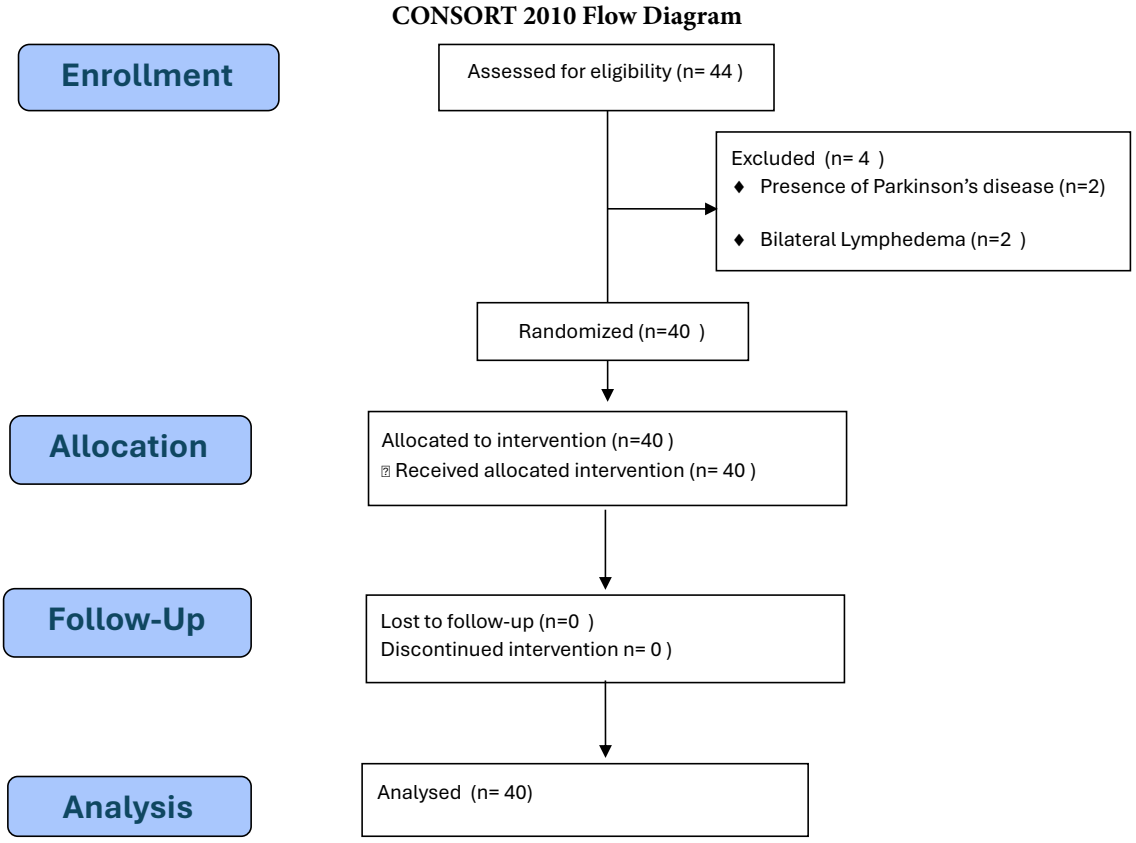

Figure 1. Study flow diagram

principles of Helsinki.The study protocol was approved by the Dr. Abdurrahman Yurtaslan Ankara Oncology Training and Research Hospital Non-interventonal Clinical Researches Ethics Committee (Date: 09.06.2022, Decision No: 2022-06/92).

Inclusion criteria: Patients aged 18-75 years, unilateral radical mastectomy (RM), with lymphoedema for at least 6 months after mastectomy. Exclusion criteria of the study: bilateral mastectomy, lumpectomy, traumatic musculoskeletal injury, patients with visual and vestibular impairment, diabetes, women with neurological deficits. Of the 44 patients included in the study, 2 patients had a diagnosis of Parkinson's disease and 2 patients had bilateral mastectomy and were not included in the study (Figure 1).

This study was guided by the Consolidated Standards for Reporting Trials (CONSORT) checklist.

Data Collection Tools

Demographic and clinical data such as age, educational status, marital status, body mass index (BMI) (kg/m^2), affected lymphedema limb (right-left) were analysed. For the evaluation of limb volume difference, limb diameter measurements were made with a standard tape measure at 4 cm intervals starting from the metacarpophalangeal joint of the hand and then calculated for each segment using the frustrum formula. The difference between the affected limb and the unaffected limb was evaluated as limb volume difference.

The Fullerton Advanced Balance Scale (FAB-Scale):

Fullerton Advanced Balance Scale (FAB-Scale) was applied to the patients to measure the balance level. FAB-Scale is a performance-based test that evaluates functional balance (static and dynamic) status. Functional balance includes static and dynamic components such as general balance ability of the body, coordination of muscles, proprioception (awareness of body position), range of motion, muscle strength and flexibility. Turkish reliability and validity study of the scale has been conducted.[7] Each item of the 10-question questionnaire is scored using a 0-4 scale.The questions of the questionnaire are summarised below.

1. Standing with feet together, eyes closed,
2. Reaching forward to pick up an object,
3. Rotation in a circle,
4. Stepping on and over a bench,
5. Tandem walking,
6. Standing on one leg,
7. Standing on the foam with eyes closed,
8. Jumping for distance,
9. Dizzy walking,
10. Recovering from an unexpected loss of balance.[8,9]

The highest score that can be obtained from this multidimensional balance assessment is 40 and the lowest score is zero. FAB-Scale ≤25 indicates a fall risk.[10] Higher scores indicate better balance abilities. The FAB-SCALE is a questionnaire that is sensitive in detecting the effects of lymphoedema in women who have survived breast cancer.[11]

The Lymphedema Quality of Life Questionnare (LYMQOL-Arm)

LYMQOL-Arm questions consist of 4 sub-units examining external appearance, upper extremity function, symptoms and mood, and the last unit, the "general quality of life" scale, is a lymphedema-specific quality of life questionnaire. In the 21-question questionnaire, the item scoring in each area is as follows: Not at all=1, somewhat=2, very=3, very=4. Higher scores indicate lower quality of life. The last question, general quality of life, is scored between 0 and 10. Higher scores indicate a better overall quality of life for the last question.[12]

Statistical Analysis

Statistical evaluation was performed with Blusky Statistics software. In the evaluation of the obtained data, continuous variables were presented as mean±standard deviation values and categorical variables were presented as frequency and related percentages. The relationships between continuous variables were evaluated using Spearman's correlation test. A P value <0.05 was considered statistically significant.

RESULTS

The mean age of the 40 patients included in the study was 59.02±7.50 years.27.5% (11) of the patients were overweight and 57.5% (23) were obese. The proportion of patients with a FAB-scale ≤25 and at risk of falls was 55% (22). The sociodemographic characteristics of the patients are summarised in Table 1.

Table 1. Sociodemographic and clinical characteristics of the patients

Age, Mean±SD (years)	**59.02±7.50**
Marital status Single Married	n (%) 28 (70) 12 (30)
Education Primary school Secondary school High school University	n (%) 29 (72.5) 1 (2.5) 5 (12.5) 5 (12.5)
BMI, Mean ±SD (kg/m²)	30.60±4.85
BMI (kg/m²) Normal (18.5-24.9) Overweight (25-29.9) Obese (30-34.9) Extremly obese (>35)	n (%) 5 (12.5) 11 (27.5) 23 (57.5) 1 (2.5)
Affected lymphedema limb Right Left	n (%) 23 (57.5) 17 (42.5)
Extremity volüme difference,Mean ±SD (ml)	655.35±356.48
FAB-scale, Mean ±SD	23.25±9.33
FAB-scale FAB-scale: ≤ 25 FAB-scale: 25 <	n (%) 22 (55) 18 (45.0)
LYMQOL-Arm, Mean ±SD	50.95±14.46

S.D.: Standart Deviation, BMI:Body Mass Index, FAB-Scale: The Fullerton Advanced Balance Scale, LYMQOL-Arm: Lymphedema Quality Of Life Questionnaire Arm

The mean quality of life score of patients with FAB-scale ≤25 was 54.727±12.811, while the mean quality of life score of patients with FAB-scale 25< was 46.333±15.374. Although this difference was numerically different, it was not statistically significant (p=0.344). The mean FAB-Scale score was 22.04±8.93 in patients with right upper extremity lymphedema (23 patients, 57.25%) and 24.88±9.87 in patients with left upper extremity lymphedema (17 patients, 42.5%). There was no statistically significant difference between the affected lymphedema limb and balance level (p=0.563). There was a significant negative correlation between age and balance level (p=0.0138). It was determined that balance impairment increased with increasing age. No significant correlation was observed between other parameters (p<0.05) (Table 2).

DISCUSSION

It is known that cancer survivors have decreased balance, increased risk of falls and this reduces the quality of life.[13] Many studies have been conducted on the physical, psychological and social complications caused by balance disorders and fall risk in women with breast cancer.[14-16] Patients who have had breast cancer may have similar static postural control in the 0-5 year postoperative period, but dynamic balance may change and functional balance may worsen.[17] However, our knowledge on

Table2. The correlations of between age, BMI, FAB-Scale, LYMQOL-arm and extremity volume difference

		Age	BMI	FAB-scale	LYMQOL-arm	Extremity volume difference
Age	r	1.0000	0.0730	-0.4886	0.1455	0.1460
	p		1.0000	**0.0138**	1.0000	1.0000
BMI	r	0.0730	1.0000	-0.3149	-0.0192	0.0755
	p	1.0000		0.4301	1.0000	1.0000
FAB-scale	r	-0.4886	-0.3149	1.0000	-0.2380	-0.2162
	p	**0.0138**	0.4301		1.0000	1.0000
LYMQOL-arm	r	0.1455	-0.0192	-0.2380	1.0000	0.2006
	p	1.0000	1.0000	1.0000		1.0000
Extremity volume difference	r	0.1460	0.0755	-0.2162	0.2006	1.0000
	p	1.0000	1.0000	1.0000	1.0000	

Spearman Correlation Test, BMI:Body mass index, FAB-Scale: The Fullerton Advanced Balance Scale, LYMQOL-Arm: Lymphedema Quality of Life Questionnaire Arm

the effects of lymphedema, a common complication of breast cancer treatment, on balance is very limited. In this study, the relationship between functional balance and quality of life in patients with unilateral BCRL was investigated.

The FAB scale test is a sensitive screening tool to identify subtle changes in functional balance abilities [8]. In our study, 55% (22) of BCRL patients with a FAB-scale score ≤25 had a high fall risk. In a study conducted in the literature, 30 BCRL patients were treated with complete decongestive therapy for 2 weeks and improvement in FAB-Scale values of patients was determined after treatment.[11] Many more studies are needed to conclude that effective treatment of lymphedema can prevent the risk of balance and falls.

In this study, it was determined that the functional balance level of BCRL patients was not affected by the age difference. In a study by Başar et al.,[18] although asymmetric fluid distribution in the upper part of the body impaired stability more in pre-elderly (<60 years) women with unilateral BCRL, no difference was found in terms of fall risk with the healthy control group. There are a limited number of studies showing that the body centre of gravity is displaced towards the side with lymphedema in patients with BCRL, disrupting postural oscillation and increasing the risk of falls. In a study conducted by Angin et al,[19] patients with lymphedema were compared with a healthy control group. It was found that increased postural oscillation in patients with lymphedema led to low postural stability.

In a study by Balzarani et al.[20] it was shown that body sway decreased during walking tests and shoulder retro-position and abduction movements decreased according to the results of biomechanical analysis of patients with lymphedema. In this study, it was also shown that the shoulder was displaced towards the side with lymphedema, but this did not affect the general stability. In our study, no significant relationship was found between asymmetric limb volume difference and functional balance in the lymphedematous arm.

In studies examining the relationship between obesity and balance in the literature, it has been observed that obesity prolongs the oscillation phase of gait.[21] The results suggest that obesity may impair balance and may be a risk factor for falls, especially during prolonged physical activity.[22] It has been observed that women with breast cancer who had obesity (BMI≥25 kg/m²) before mastectomy are more likely to develop lymphedema within 6-18 months after surgery.[23]

In a meta-analysis of risk factors for the development of lymphedema, high body mass index and high weight gain were found to increase lymphedema.[24] In the case of lymphedema and obesity comorbidity, the increase in mass in different parts of the body may affect balance control and consequently activities of daily living. Although it was concluded that the quality of life of the patients in this study was not affected by the limb volume difference between both arms and body balance level, we think that a much larger number of patient studies are needed in this regard.

Limitations

Firstly, the wide age range (18-75 years) may have increased the variability and heterogeneity of the sample. In older patients (60-75 years), there may be age-related changes in the sensory and motor system, although not diagnosed. The lack of a control group and the single-arm exploratory study were important limitations of the study.

CONCLUSION

The results of this study showed that the majority of BCRL patients had poor balance, but there was no significant correlation between balance level and BMI, limb volume difference, quality of life, balance status worsened and the risk of falls increased in older patients. Every woman with breast cancer-related lymphedema should be informed about balance and gait impairment and encouraged to receive lymphedema treatment as soon as possible. In the future, we think that studies examining the relationships between functional stability, quality of life and fall risk in the treatment of lymphedema and the development of special interventions related to balance will contribute to the oncological rehabilitation protocol.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Dr. Abdurrahman Yurtaslan Ankara Oncology Training and Research Hospital Non-interventonal Clinical Researches Ethics (Date: 09.06.2022, Decision No: 2022-06/92).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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